

**AMENDMENT TO THE SPECIFICATION**

On page 1, please amend the title as follows:

**METHOD OF FORMING COMPOSITE BARRIER LAYERS WITH CONTROLLED  
COPPER INTERFACE SURFACE ROUGHNESS**

On page 4, please amend paragraph [16] as follows:

[01] Embodiments of the present invention comprise controlling the average surface roughness (Ra) of the exposed surface of the composite barrier layer by varying: (a) the ratio of the thickness of the combined  $\alpha$ -Ta and graded tantalum nitride layers to the thickness of the initial TaN layer; and/or (b) the N<sub>2</sub> flow rate during deposition of the initial TaN layer.

On page 6, please amend paragraph [0027] as follows:

[02] In an embodiment of the present invention, a three barrier layer composite is formed comprising an initial layer of TaN, a graded layer of tantalum nitride on the initial TaN layer, and a layer of  $\alpha$ -Ta on the graded tantalum nitride layer. The graded tantalum nitride layer typically has a N<sub>2</sub> content which decreases from proximate the initial TaN layer formed lining the opening to about zero proximate the  $\alpha$ -Ta layer, and typically contains  $\alpha$ -Ta in an amount from about zero proximate initial TaN layer increasing to about 100% proximate the  $\alpha$ -Ta layer. The initial TaN layer typically has a N<sub>2</sub> content substantially corresponding to that of the initial TaN layer proximate the initial TaN layer, i.e., about 30 to about 65 at.% and decreases to about zero proximate the  $\alpha$ -Ta layer. The resistivity of the graded tantalum nitride layer depends upon the N<sub>2</sub> content and is typically about 200 to about 900  $\mu\text{ohm-cm}$  proximate the initial TaN layer decreasing toward the  $\alpha$ -Ta layer, e.g., about 20A° to about 300A°. The three barrier layer composite embodiment of the present invention typically has an overall thickness of about 50A° to about 500A°.